

REMARKS

Claims 9 and 16 are amended herein. Support for the amendments can be found throughout the specification, for example, page 16, lines 25-29, page 17, line 30 to page 18, line 6, and page 22, lines 11-16. Claims 1-8, 12, and 19 have been previously cancelled. Accordingly, 9-11, 13-18, and 20-22 remain pending. In view of the amendments and remarks set forth herein, reconsideration is respectfully requested.

Claims 9 and 13-15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Japan 04-206875 (hereinafter '875) in view of Amano (U.S. 5,289,038). Claims 16 and 20-22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over '875 in view of Amano and further view of Locke et al. (US 5,425,751). Claims 17 and 18 stand rejected under 35 U.S.C. §103(a) as being obvious over '875 in view of Amano and Locke, in further view of Schneble, Jr. et al. (U.S. 3,628,999).

The examiner asserts that the '875 reference provides all of the features of the claims except that, before forming the inner layer, an oxide is formed on an inner peripheral surface portion of the non-through hole adjacent to the first surface of the substrate and on a portion of the first surface of the substrate adjacent to the non-through hole, such that only the oxide layer is layered on the substrate. The examiner then relies upon Amano for the teachings of this reference. The examiner relies upon Schneble for the teaching of filling the non-through hole by

immersing the substrate in a molten metal and then solidifying the metal by discharging the substrate from the molten metal. The examiner relies upon Locke et al. for the teaching that the hole is a through hole that extends through the work piece and that the metal filling method further comprises closing the opening of the through holes and then opening the closed opening. The examiner also relies upon Locke for the disclosure of closing the opening using sealing material.

As mentioned above, Claims 9 and 16 have been amended to further specify that filling the through hole with molten metal is performed by relatively reducing the pressure in the non-through hole compared with the pressure outside the non-through hole. This element is not disclosed in '875, or any of the secondary references relied upon by the examiner.

For example, the '875 reference provides no disclosure of how the gold grain (7) in Fig. 1 is inserted from the capillary tube (8) into the through-hole. Amano generally discloses the metal bump (26) in Fig. 3D grown in concave (21) by an electroplating process. (Col. 5, lines 59-61). Schneble discloses the board of Fig. 1G subjected to a solder bath to produce the metal (24) in hole (28). (Col. 4, lines 69-72). Locke merely describes plating a metal into the through-hole. (Col. 5, lines 12-14). Thus, the method of how the metal is filled in the through-hole is not disclosed.

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Filing Date: April 8, 2004
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In view of the fact that all of the elements of the pending claims are not disclosed or obvious in view of the cited references, withdrawal of the rejections under 35 U.S.C. §103(a) is respectfully requested.

Conclusion

Applicants submit that the application is now in proper form for allowance, which action is earnestly solicited. If resolution of any remaining issue is required prior to allowance of the application, it is respectfully requested that the Examiner contact Applicants' attorney at the telephone number provided below.

Respectfully submitted,

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